INTERNALIZED CONTRIBUTION NORMS AND LEARNING IN A PUBLIC GOODS EXPERIMENT IN GHANA*

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ABSTRACT

This paper links a utility theoretic model based on internalized norms with the results from a novel public good experiment in Ghana. The results indicate that, on average, people are motivated by condition- al cooperation or reciprocity: i.e. they want to contribute more if others have contributed more in the previous round. We also find evidence of learning, in the sense that people's contributions decrease over time even when others' contributions are held constant. Moreover, our results indicate that the decision to contribute or not does not depend on the size of the contribution of others.

1. INTRODUCTION

Traditionally, economists have focused almost exclusively on economic (i.e., monetary) policy instru-

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ments, together with command and control policy and property right issues, when analyzing the free-riding behavior associated with public goods of which the environment is a typical example (Baumol and Oates, 1988; Hanley et al., 1997; Brekke and Johansson-Stenman, 2008). However, although some subjects in public good games play the dominant strategy, initial average contributions are generally about one-half of their endowments. This indicates that people under some conditions free-ride to a much lower degree than what standard economic theory predicts (Weimann, 1994; Fehr and Gächter, (2000); Andreoni et al., 2003; Gintis et al., 2005; Nikiforakis and Normann, 2008). Several explanations have been proposed, including altruism, confusion, conditional cooperation, reciprocity and perceived fairness (Andreoni, 1988; Andreoni et al., 2003; Ostrom, 1990; Ostrom et al., 1994; Palfrey and Prisbey, 1996, 1997; Fehr and Gächter, 2000; Camerer, 2003; and Fehr and Fischbacher, 2004).

This paper presents a simple public good experiment designed to capture some of the important characteristics of environmental and natural resource problems in many developing countries with poorly working formal institutions. First, the experiment is performed in a developing country (Ghana). Second, our experimental design acknowledges that an individual's behavior is often difficult to observe by others; hence individual anonymity is ensured.[†] Third, the environmental outcome typically depends on repeated interactions between people. However, the repetitions are typically not made infinitely, or very many times, with the same people involved. This implies that the so-called folk theorem (Fudenberg and Maskin, 1986) is of little help. Therefore the design takes into account that an individ-

[†] This does not imply that it is always impossible to observe the behavior of others with respect to the environment, or that the social disapproval effect is unimportant; cf. Rege and Telle (2004) and Masclet et al. (2003).

ual interacts with different people, and that experiences from interaction with one group of people may spill over to an individual's behavior when interacting with another group.

There is much empirical evidence that some people tend to make positive contributions in one-shot public good experiments (or voluntary contribution mechanisms), despite the opposite prediction of conventional economic theory; see Dawes (1980), Isaac and Walker (1988), Ledyard (1995), or Zelmer (2003) for extensive surveys.[‡] It has also been found that people's contributions decrease gradually toward the conventional Nash prediction when a game is played repeatedly. This has been seen as evidence of individual errors and learning (e.g. Andreoni, 1988). An alternative explanation is that conditional cooperation is the main (or at least an important) driving force behind the observed pattern (Fischbacher et al., 2001; Gächter, 2007). According to this view, many people are willing to cooperate, even at a private cost, but only if others cooperate too.

In this paper, we present a simple utility theoretical framework where people derive utility from fulfilling social norms related to both the expected contributions of others and others' actual contributions in the previous round. We directly estimate the parameters of the assumed utility function based on the results from our experiment, and use a standard two-round linear public good experiment based on 12 groups with 4 people in each group. After the first round, the members in each group are informed about the average contribution of others in their own group. Then the game is played a second (and last) time. After this, there is a surprise restart with re-matching of players, and two additional rounds are played. We also vary the exchange rate be-

[‡] This does not mean that all, or almost all, people tend to cooperate in such games; it is typically found that a substantial fraction of the population contributes nothing.

tween public and private money among the groups. In principle, we are able to analyze four separate components:

i. How much higher an individual's contribution would have been had the average contribution of others in the group been one token higher.
ii. How much higher an individual's contribution would have been had the average contribution of others in the group that the individual belonged to in the previous round been one token higher.
iii. How much the exchange rate from private to public money affects the contribution.
iv. How large the effects of potential learning are; i.e. to what extent the contribution decreases toward the conventional Nash prediction over time holding others' behavior fixed.
v. Whether the decision to contribute or not depend on the extent of the contribution of others.

To our knowledge, these motives have not been analyzed simultaneously before. Section 2 presents the theoretical model, followed by the experimental design in Section 3 and the empirical strategy and hypotheses in Section 4. Section 5 presents the results while Section 6 concludes the paper.

2. THE MODEL

The conventional model, where utility is solely a function of individual payoffs or income, can obviously not explain the widespread observed experimental evidence that people tend to contribute non-negligible amounts in public good games. Here we therefore first present a model where utility depends on the degree to which two internalized social norms are fulfilled, followed by an extended model that include learning where people for cognitive reasons deviate from the conventional Nash equilibrium.

2.1 INTERNALIZED NORMS

We hypothesize that a representative individual in addition to his own payoff also cares about fulfilling *internalized contribution norms.* By such a norm we, following Bowles and Gintis (2005), mean "a norm that one has accepted, not as a constraint, but rather as an *argument of one's objective function*" (italics in origin). Deviation from such norms causes a *psychic cost* to the individual. Following Bowles and Gintis (2005) and Alpizar et al. (2008) we assume that these psychic costs are quadratic in the difference between the individual contribution to the public good and the corresponding contribution norm, and that they can be imposed additively in the utility function. Hence, we assume that there is a negative utility term associated with each norm, where the size of this term is quadratic in the difference between the individual contribution to the public good and the corresponding contribution norm.

Consider next the determinants of the norms. Given the potential importance of conditional cooperation (e.g., Weimann, 1994, Fischbacher et al., 2001; Frey and Meier, 2004) it makes sense to model one of these norms as the average of others' (expected) contributions.[§] Since reciprocity (e.g. Fehr and Gächter, 2000) is another potentially important motive behind cooperation, it is natural to model the second norm as how much others have contributed in the last round. These norms can thus be either forward or backward looking. That is, an individual may, *ceteris paribus*, want to contribute as much as he expects that others will contribute in the present round (based on the conditional cooperation motive) or as much as others have actually contributed in the last round (based on the reciprocity motive). A recent field experiment by Frey and Meier

[§] There is also evidence from "think-aloud" methodology that people in environmental valuation studies seem to be influenced positively by others' contributions (Schkade and Payne, 1994).

(2004) found that voluntary contributions correlate positively with beliefs about others' contributions as well as others' actual previous contributions.

Since we use a simple linear public good game, a representative individual *i*'s income at period *t*, Y_{it}, is given by the initial endowment, ω, minus the contribution, x_{it}, plus the total contribution by all *n* individuals in the group, $\sum_{j=1}^{n} x_{jt}$, multiplied by a constant, $0 < m_{it} < 1$, reflecting how much *i* (and everybody else) himself gains back from contributing one unit. The utility function for an individual *i* at time *t* can then be written:

$$u_{it} = \omega - x_{it} + m_{it}\sum_{j=1}^{n} x_{jt} - \beta\left(E(\bar{x}_{-i,t}) - x_{it}\right)^2 - \gamma\left(\bar{x}_{-i,t-1} - x_{it}\right)^2, \quad (1)$$

where $E(\bar{x}_{-i,t})$ is *i*'s expectation of others' average contribution at time *t*, and $\bar{x}_{-i,t-1}$ is others' actual average contribution at time $t-1$. The first three terms hence reflect the monetary payoff, whereas the fourth and the fifth reflect the psychic costs of deviating from the social norms. The fourth term thus reflects the disutility from deviating from the expectation of how much others will contribute in the present round, whereas the fifth term reflects the disutility from deviating from how much others did in fact contribute in the last round. Note that we treat this utility function as purely ordinal, meaning that any monotonic transformation of *u* is an equally valid utility function.

Individual *i*'s best response, assuming an interior Nash equilibrium solution,[**] is obtained by maximizing

[**] Note that this is a Nash equilibrium that takes into account the effects of the social norms, i.e. it is not the same as what we have

(1) with respect to his contribution, implying the first order condition:

$$-1+m_{it}+2\beta\left(E(\bar{x}_{-i,t})-x_{it}\right)+2\gamma\left(\bar{x}_{-i,t-1}-x_{it}\right)=0. \quad (2)$$

Solving for x_{it} then implies:

$$x_{it}=-\frac{1}{2(\beta+\gamma)}+\frac{1}{2(\beta+\gamma)}m_{it}+\frac{\beta}{\beta+\gamma}E(\bar{x}_{-i,t})+\frac{\gamma}{\beta+\gamma}\bar{x}_{-i,t-1} \quad (3)$$

2.2 LEARNING

Let us now for comparison consider the learning explanation of the observed behavior in public good experiments, based on the idea that people make errors and learn over time (see e.g. Andreoni, 1988; Palfrey and Prisbey, 1996, 1997). There is much evidence that without any form of punishment mechanism, average contributions in public good games generally decay over time, and moreover that this is true both in partner as well as stranger treatments (see e.g. Andreoni, 1988; Weimann, 1994; Croson, 1996; Palfrey and Prisbey, 1996, 1997; Botelho et al. 2009). In addition, in a "restart" of the game, the first average contribution after the restart is lower than the initial average contribution (see, e.g., Andreoni, 1988; Croson, 1996). The learning explanation is clearly consistent with this pattern. In order to model learning, let the corresponding utility function be

$$u_{it}=\omega-x_{it}+m_{it}\sum_{j=1}^{n}x_{jt}-\rho\left(x_{it}-\hat{x}_{it}\right)^{2}, \quad (4)$$

previously described as "conventional Nash equilibrium", where people only care about their own material payoff.

where $\hat{x}_{it}$ is a “cognitive anchor” that influences an individual’s decision. One possible interpretation is that the individuals initially do not fully understand that it is in their own interest to contribute noting (ignoring non-selfish and social motives). Note that utility in (4) reflects *decision* utility (Kahneman et al., 1997; Kahneman and Thaler, 2006), and that *experienced* utility here is assumed to solely depend on monetary payoff, i.e. the first three terms. For analytical simplicity, we model learning as a simple linear process, in the interval considered, as:

$$\hat{x}_{it} = \hat{x} - \varsigma t \,, \tag{5}$$

as long as $\hat{x}_{it} > 0$; otherwise $\hat{x}_{it} = 0$. Substituting (5) into (4) gives:

$$u_{it} = \omega - x_{it} + m_{it} \sum_{j=1}^{n} x_{jt} - \rho \left(x_{it} - \hat{x} + \varsigma t \right)^2 . \tag{6}$$

The individual behavior is, by definition, characterized by maximizing decision utility. Maximizing (6) and solving for x_{it} gives:

$$x_{it} = \hat{x} - \frac{1}{2\rho} + \frac{m_{it}}{2\rho} - \varsigma t \,. \tag{7}$$

Thus, according to this learning explanation, the contribution should be positively related to *m* and negatively to time (as reflected by the number of rounds played).

3. THE EXPERIMENTAL DESIGN

The experiment was based on standard linear public good games with 4 players. Each player had an equal initial endowment of 10 units, and had to decide how many of these to allocate to a public good (the environment) and how many to keep for himself. The amount provided to the public good was multiplied by a constant 4*m*, such that $1 < 4m < 4$, and then shared equally. The payoff to an individual *i* is then given by $10 - x_i + m_i \sum_{j=1}^{4} x_j$. There were 12 groups that differed from each other with respect to the value of *m*. The subjects were informed that they would play the game twice with the same participants in the group. After each subject had made a decision, information on the contribution made by each group member was written down and handed out to all members of the group. Then each subject made a second decision about how much to contribute in the second round. The experiment was completely anonymous, meaning that no player had any information that could be used to identify any of the 3 other subjects he/she was playing with among the 47 potential group members in the room.

After the two rounds, there was a surprise restart. New teams were made and two more rounds with new *m*-values were played. Like previous experiments (e.g. Palfrey and Prisbey, 1996; 1997), different values of *m* were used to be able to determine its impact on the contributions. The subjects were informed that there would be no further subsequent surprises. Let us denote the rounds (in order) A1, A2, B1, and B2. The value of *m* varied among the groups, ranging from 0.3 to 0.9, which implies that the exchange rate between public and private money *4m* varied from 1.2 to 3.6. All subjects had a higher *m* in B than in A (see Table A in Appendix I for further information). As specified in the instructions, a coin was tossed to determine which set of decisions (A1+A2 or B1+B2) was to be used for actual payments. Thus, in total each subject made four sequential decisions (see Appendix II for the instructions to the experiment).

The experiment was conducted in a big classroom with 48 students from the University of Cape Coast in

Ghana. The competition to be accepted into the university is fierce, and there is no reason to expect these students to be less capable than students in Western countries. Moreover, the students come from all over Ghana, and many of them belong to families that depend heavily on natural resources for their subsistence.

Participation in the experiment was voluntary and the subjects were randomly selected from various programs. There was no show-up payment. Notices were posted at residence halls and requested volunteers to sign up and participate in an economic decision-making experiment from which there was an opportunity to earn cash. A total of 113 students signed up. Out of these, the first 48 were recruited for the experiment. Each subject was given an identification number that was not known to any other participant. Moreover, the subjects were strictly prohibited to talk to each other throughout the experiment (and nobody did). The experiment began with a set of questions to train the subject to compute his/her earnings for various contribution profiles. A slightly shortened version of the question and information set used by Fischbacher et al. (2001) was used. To make the notion of the Nash equilibrium and social optimum contribution evident, each subject computed his/her earnings for two situations: if he/she contributed nothing and if he/she contributed his/her full endowment. When all subjects had successfully computed their earnings, the actual experiment began. It lasted for one-and-a-half hours and at the end of the experiment all subjects were paid the cash equivalent of what they had earned in the game. The mean earning was 9.83USD. This is a substantial amount compared to the favorable loans of about 6 USD per week that the students receive during the semesters to finance their living expenditures. Consequently, the students were very focused during the experiments.

While we are concerned about the respondents' expectations of others' contributions, we did not ask explicitly about these expectations. There are two common ways of doing this, and both have their own problems: If the expectation of others' contributions is asked for *before* the contribution decision, there is a risk that this question, and the corresponding cognitive process, affects the subsequent contribution decision. As argued by Rutström and Wilcox (2009), elicited beliefs in games are not strictly exogenous since it may alter strategic actions that the game may wish to predict. Thus, in eliciting beliefs, players may have to consciously state their beliefs, which could then influence their subsequent actions or play, while behavior could indeed be driven by some non-conscious cognition. Consequently, elicited belief may not necessarily be a good predictor of behavior. If instead the expectation is asked for *after* the contribution decision, there is a risk that the contribution decision affects the stated expectation. For these reasons, we instead used others' contribution in the previous round as a proxy for the expectation of others' contribution in the present round. This approach of course has its own problems.

First, strategic considerations could give rise to a different pattern with or without a restart, since there are no strategic reasons to contribute in the last round with the same co-players. However, since each individual only plays two rounds within each group, the strategic motive for contributions is presumably weak generally.

Second, it is possible that some respondents anticipate a systematic pattern of the average contribution over time. Nevertheless, our conjecture is that these problems are smaller than with the conventional approaches. Indeed Rutström and Wilcox (2009) found in their game theoretic experiments that beliefs estimated from past observed information of other players can predict behavior better than stated beliefs, especially in a complex setting.

4. EMPIRICAL STRATEGY AND HYPOTHESES

We are here interested in estimating the parameters of a representative individual's utility function, and comparing these with the hypotheses associated with the model in Section 2.

In the empirical analysis of the data, we first run a straightforward standard ordinary least square (OLS) regression:

$$x_{it} = \theta + \mu m_{it} + \sigma \bar{x}_{-i,t-1} + \tau D\bar{x}_{-i,t-1} + \upsilon t + \varepsilon, \qquad (8)$$

where $x_{it} \geq 0$ is i's contribution in round t, θ is an intercept, m_{it} reflects how much an individual directly gets back from contributing one unit in period t, $\bar{x}_{-i,t-1}$ is the average of others' contribution in the previous round (which we assume reflects the expected average contribution of others in the present round), D is a dummy variable that equals 1 for t = 3 (round B1), i.e. when the individual changes groups and ε is assumed to be approximately normally distributed, reflecting both decision errors and preference heterogeneity.

Let us now link the above empirical model with the theoretical models in Section 2. In doing this, we would like to identify the above estimated parameters in terms of the coefficients of the utility functions, as given by (1) and (4), respectively. Let us start with the norm-based model. Then, by using (3) and (8) we obtain that $\beta + \gamma = 1/(2\mu)$. Hence, if the estimated coefficient associated with m (how much an individual gets back from contributing one unit) is positive, then the combined parameters of (1) reflecting conditional cooperation and reciprocity, respectively, is also positive. From similarly identifying the $\bar{x}_{-i,t-1}$ parameters, under the assumption that $E(\bar{x}_{-i,t}) = \bar{x}_{-i,t-1}$ (and when holding a possible reciprocity effect constant), we get $\beta/(\beta+\gamma)=\sigma$. In other words, if the combined norm effect given by $\beta+\gamma$ as given above is positive, then if $\sigma>0$ it follows that $\beta>0$, i.e. the parameter associated with conditional co-operation would be positive as hypothesized. Similarly, identifying the parameters associated with reciprocity, we have that $\gamma/(\beta+\gamma)=-\tau$. In other words, if again $\beta+\gamma>0$ then the reciprocity parameter γ in (1) is positive (as hypothesized) if the parameter associated with the changing group effect τ is negative. By substituting $\beta+\gamma=1/(2\mu)$ into the above relationships associated with conditional cooperation and reciprocity, respectively, we can alternatively express these effects solely in terms of the estimated parameters, as follows: $\beta=\sigma/(2\mu)$ and $\gamma=-\tau/(2\mu)$.

Since there is no learning in the norm-based model, it is here hypothesized that $\upsilon=0$. In the learning-based model, in contrast, we can identify the *t*-parameters from (4), (7) and (8) as $\varsigma=-\upsilon$. Thus, if $\upsilon=-\varsigma<0$, the contribution decreases over time (i.e., is lower in a later round) even if others' previous contributions are corrected for.

In addition to the OLS regression, with no particular treatment of the zero contributions, we estimated both a tobit model and a two-stage model. Following Botelho et al. (2009), the decision to contribute can be seen as a "hurdle" that a subject has to first overcome before deciding on the size of his/her positive contribution. This stage is here modeled with a Logit regression. For the second stage we run an OLS regression on the non-zero contributions. The total marginal effects (at sample means) were than calculated following the McDonald and Moffitt (1980) decomposition as follows:

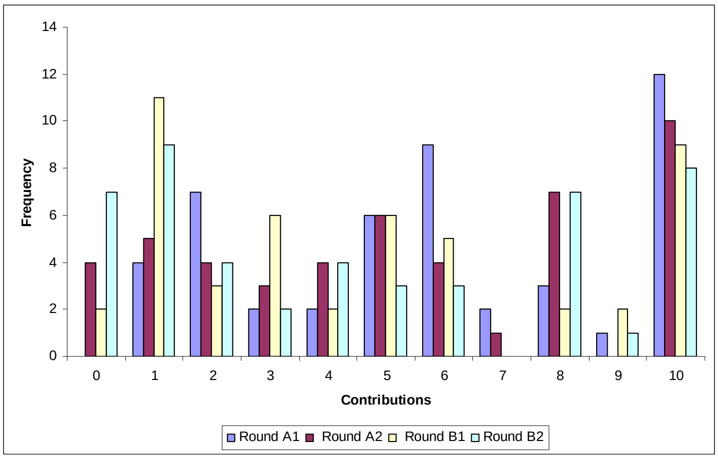
$$\frac{\partial E[x_{it}]}{\partial q}=\Pr[x_{it}>0]\frac{\partial E[x_{it}\mid x_{it}>0]}{\partial q}+E[x_{it}\mid x_{it}>0]\frac{\partial \Pr[x_{it}>0]}{q} \quad (9)$$

where q is any explanatory variable.

5. RESULTS

The mean contributions of the four rounds were 5.91, 5.32, 4.72, and 4.52. Based on paired t-tests, the mean of A1 (i.e., 5.91) is significantly higher than that of B1 (i.e., 4.72) ($p < 0.006$). However, we cannot reject the hypothesis that the means of the first two rounds (i.e., A1 and A2), the last two rounds (i.e., B1 and B2) and the second and third rounds (i.e., A2 and B1) are equal. Moreover, the results from the non-parametric Mann-Whitney-U test are similar, with the exception that the difference between the distributions of A1 and B1 is now less significant ($p < 0.06$). Thus, although the mean contributions in the first rounds of the two sections are significantly different, there is no significant difference between the round before the group was changed and the first round after the group was changed, which seems to indicate that past experiences influence present behavior even in an unrelated environment.

Figure1: Frequency Distribution across Rounds.



The frequency distributions averaged over all four rounds are presented in Figure 1. Overall, full cooperation was obtained in about 20% of the cases, while the extreme self-interestedness (i.e., the Nash prediction based on conventional self-interested preferences) was obtained in only 7% of the cases.

Table 1 presents the regression results. For the OLS regression, which includes zero contributions, we obtain a positive effect of the exchange rate between public and private money, which is consistent with the results in several other studies; see, e.g., Palfrey and Prisbey (1996), and Zelmer (2003) for a meta-analysis of public good games. The coefficient of the expected average contribution of others in the preceding round (i.e., α) is positive and statistically significant, supporting the conditional cooperation hypothesis (consistent with e.g. Croson et al. 2005). A coefficient of 0.32 implies that a subject would contribute an additional 0.32 units if others had contributed 1 unit more in the last round (which we interpret as an expectation for the current round).

The reciprocity hypothesis implies that the change of group effect should be negative, as explained above. This is also the case, although this effect is not significant at conventional levels. Still, the parameter estimate of -0.156 indicates that the reciprocity effect appears to be about half as large as the conditional cooperation effect. So far, the results are overall in line with the norm-based model.

However, the time trend is negative and significant. The size of the parameter, which is about unity, indicates that everything else constant, a subject would contribute about one unit less per round. This is consistent with the learning hypothesis and mimics the findings of Palfrey and Prisbey (1997) and Croson et al. (2005), among others, that people's contributions decrease over time, even when others' contributions have been controlled for. Yet, the above results related to others' contribution imply that learning can obviously not explain the whole story either. Hence, while learning appears to be one reason behind the well-known convergence towards the conventional Nash equilibrium, the results here indicate that it is not the sole reason.

Table 1
Regressions of determinants of own contribution

	One-stage regressions		**Two-stage "hurdle" regression**		
	OLS	**Tobit**	**Logit** Marginal Effect	**OLS**	**Combined** Marginal Effect
Average Contribution of Others in Previous Round	0.321 (2.07)**	0.333 (2.01)**	0.010 (1.17)	0.274 (1.82)*	0.305 (2.09)**
Marginal Benefit of Contributing to Pubic Good	6.688 (2.94)***	7.21 (2.82)***	0.163 (1.01)	6.223 (2.58)***	6.563 (2.77)***
Time Trend	-1.139 (-2.54)**	-1.270 (-2.55)**	-0.038 (-1.40)	-0.988 (-2.09)**	-1.109 (2.43)**
Change of Group Effect	-0.156 (-1.54)	-0.144 (-1.17)	0.014 (1.48)	-0.208 (1.86)*	-0.112 (0.99)
Constant	2.983 (2.02)**	2.831 (1.83)**			
Statistical observations	144	144	144	131	
R-squared	0.10	0.02	0.08	0.06	

* Significant at 10%; ** significant at 5%; *** significant at 1%, *t*-statistics are in parentheses.

The results based on the Tobit model are overall rather similar, both in terms of marginal effects and statistical significance. None of the coefficients in the Logit regression is significant. This is consistent with some previous empirical evidence from both field and laboratory public good experiments indicating that the decision to contribute anything is rather insensitive to information regarding the contribution of others (e.g. Weimann, 1994; Frey and Meier, 2004). The total marginal effect of the two-stage model is again quite similar to the results from the one-stage models, both in terms of magnitudes and statistical significance.

6. CONCLUSION

In the present paper we have linked a utility theoretic model based on internalized norms and learning, respectively, with the results from a public good experiment with a novel design in Ghana. This has enabled us to derive novel hypotheses in the way they distinguish between forward-looking conditional cooperation and backward-looking reciprocity. The results from our experiment are consistent with a model indicating that people care about fulfilling social norms, which in turn depend on others' historical contributions and expectations about future contributions. However, the results also indicate that learning plays a role; i.e., contributions decrease over time, *ceteris paribus*. Thus, the results indicate that both conditional cooperation (and possibly reciprocity) and learning are important in order to understand the well-known pattern of convergence over time towards the conventional Nash equilibrium. Moreover, consistent with previous studies, the discrete decision whether to contribute or not is not significantly influenced by the extent of others' contribution.

When considering potential implications for policy, one must bear in mind that external validity is always an issue in economic experiments. However, if one is willing to take the risk of generalizing some insights more broadly, an implication is that one should not solely focus on monetary incentives, but also consider intrinsic motivations. More specifically, the perceived fairness of policy is likely to affect people's willingness to comply. However, the results obtained do not imply that voluntary contribution would in any way be sufficient. On the contrary, in a situation with a high degree of anonymity, it can be expected that people's cooperative behavior will deteriorate over time. Thus, an important policy instrument to encourage voluntary contributions may be to try to reduce the extent to which people can act anonymously, e.g., by publicly providing various kinds of information on individual behavior (cf. Rege and Telle, 2004). In order to sustain cooperation in the long run, there is also much evidence that some kind of social sanction is needed (Dreber et al., 2008; Gürerk et al., 2006).

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APPENDIX I

Table A: Subject ID and Two Randomly Assigned m_i **(i.e.** m_1 **,** m_2 **)**

Subject ID	*m* in A1 and A2	*m* in B1 and B2	Subject ID	*m* in A1 and A2	*m* in B1 and B2	Subject ID	*m* in A1 and A2	*m* in B1 and B2
1	0.3	0.4	**17**	0.4	0.5	**33**	0.5	0.6
2	0.3	0.5	**18**	0.4	0.6	**34**	0.5	0.7
3	0.3	0.6	**19**	0.4	0.7	**35**	0.5	0.8
4	0.3	0.7	**20**	0.4	0.8	**36**	0.5	0.9
5	0.3	0.4	**21**	0.4	0.5	**37**	0.5	0.6
6	0.3	0.5	**22**	0.4	0.6	**38**	0.5	0.7
7	0.3	0.6	**23**	0.4	0.7	**39**	0.5	0.8
8	0.3	0.7	**24**	0.4	0.8	**40**	0.5	0.9
9	0.3	0.4	**25**	0.4	0.5	**41**	0.5	0.6
10	0.3	0.5	**26**	0.4	0.6	**42**	0.5	0.7
11	0.3	0.6	**27**	0.4	0.7	**43**	0.5	0.8
12	0.3	0.7	**28**	0.4	0.8	**44**	0.5	0.9
13	0.3	0.4	**29**	0.4	0.5	**45**	0.5	0.6
14	0.3	0.5	**30**	0.4	0.6	**46**	0.5	0.7
15	0.3	0.6	**31**	0.4	0.7	**47**	0.5	0.8
16	0.3	0.7	**32**	0.4	0.8	**48**	0.5	0.9

APPENDIX II

Sample instruction for a subject with $m_1 = 0.3$ and $m_2 = 0.4$

SECTION A

You are participating in an economic experiment. The instructions you are about to read are self-explanatory. Now that the experiment has begun, we ask that you do not talk to anyone. The participation in the experiment is voluntary. You will be presented with a scenario in which you can earn cash. Please hold on to the code number form since you will need this form when collecting your earnings.

During the experiment, any communication with other participants is strongly prohibited. Please raise your hand, if you have any question or if there is anything that is not clear to you. We will answer all your questions individually. It is very important that you follow this rule otherwise you will be excluded from the experiment.

In this experiment, you are matched with three other people so it is a group consisting of four members. The other group members are other participants. Except for us, nobody knows who is in your group.

You are a member of a group of four people. Each person has to decide on the division of 10 tokens. You can put these 10 tokens in a private account or you can invest them fully or partially in a project. Each token you do not invest in the project will automatically be transferred to your private account. From the token you invest in the project. Each member will get the same payoff. Of course, you will also get a payoff from the tokens the other group members invest in the project.

For each group member, the income from the project will be determined as follows: Income from the project equals the sum of the contributions to the project times **0.3.** For example, if the sum of all contributions to the project is 30 tokens, then you and all others will get a payoff of **30 * 0.3 = 9.0** tokens from the project.

Your total income in tokens = **(10-your contribution to the project) + (0.3 * the sum of all contributions to the project)**

You will take the decision **two times** and the total amount of tokens you earn will be converted to Cedis at the following exchange rate: **1 token=3.000 Cedis**. After you take the first decision, you will be given information on the contributions that is made by each ID number in your group to the project.

As you know, you will have 10 tokens at your disposal in each of the two rounds. You can put them in a private account or you can invest them in a project.

How many of the 10 tokens do you want to invest in the project in this round?

____________________ Tokens (in integer numbers and. a number not less than 0 and not more than 10)

SECTION B

The instructions you are about to read are self-explanatory and similar to that of **Section A, except the fraction that multiplies the total contribution by all members of your group**. Now that the experiment has begun, we ask that you do not talk to anyone. This is the **LAST** section of the experiment**. A coin will be tossed to determine which one of the two decisions you made (i.e. decision in Section A and Section B) will be used to pay you in cash. The payment will be**

made at the end of this session. Please hold on to the code number form since you will need this form when collecting your earnings.

During the experiment, any communication with other participants is strongly prohibited. Please raise your hand, if you have any question or if there is anything that is not clear to you. We will answer all your questions individually. It is very important that you follow this rule otherwise you will be excluded from the experiment.

In this experiment, you are matched with three other people so it is a group consisting of four members. The other group members are other participants. Except for us, nobody knows who is in the group. **The group members are NOT the same as those in Section A.**

You will be a member of a group of four people. Each person has to decide on the division of **10** tokens. You can put these **10** tokens in a private account or you can invest them fully or partially in a project. Each token you do not invest in the project will automatically be transferred to your private account. From the token you invest in the project, each member will get the same payoff. Of course, you will also get a payoff from the tokens the other group members invest in the project. **Please note that in Sections A and B below, you have different values that multiply the amount invested in the project**.

For each group member, the income from the project will be determined as follows: Income from the project equals the sum of the contributions to the project times **0.4.** For example, if the sum of all contributions to the project is **30** tokens, then you and all others will get a payoff of **30 *0.4 = 12.0** tokens from the project.

Your total income in tokens = **(10-your contribution to the project)** + (**0.4* the sum of all contributions to the project**)

You will take the decision **two times** and the total amount of tokens you earn will be converted to Cedis at the following exchange rate: **1 token=3.000 Cedis**. After you take the first decision, you will be given information on the contributions to the project that is made by each ID number in your group.

As you know, you will have **10** tokens at your disposal. You can put them in a private account or you can invest them in a project.

How many of the **10** tokens do you want to invest in the project?
____________________ Tokens (in integer numbers and. a number not less than 0 and not more than 10).